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OCEANOGRAPHICAL NOTES.

BY

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OBSERVATIONS ON THE OCEANS.—The publication of observations upon the oceans is discussed by Dr. Köppen in the *Annalen der Hydrographie und Maritimen Meteorologie*, Heft V, 1899. After a carefully-prepared statement of the history of such publications he suggests three methods of procedure:

1. The publication of a portion of these observations in the form of synoptic tables or charts;

2. The publication of certain good "log books" *in extenso*;

3. The printing of short reports of voyages, from which could be derived:

a. The contents of the "log" for given times and places.

b. Some of the principal features of certain climatic zones.

These suggestions are followed by a series of applications showing how such materials could be utilized.

A LARGE NUMBER OF OCEANOGRAPHICAL WORKS are reviewed in *Petermanns Mitteilungen*, Vol. 45, No. 5, 1899.

Professor Dr. Krümmel first takes up the chart of ocean currents produced last year by Dr. Gerhard Schott. Pointing out the fact that all such wall maps are behind the times, he calls attention to the fact that the construction of this chart makes it impossible for any one to follow its details at a greater distance than ten feet. Another criticism is based upon the idea that the draftsman seemed to think it necessary to construct a complete set of currents, and consequently drew curves and lines where it is a physical impossibility for currents to exist, as, for example, in the Pacific Ocean off the coast of New Zealand. This criticism is very well founded, as it is very desirable that only well-authenticated facts and observations should be embodied in charts of any sort. Inferences should be indicated in some way to carry the information that they are not based on observed facts. Professor Krümmel then points out some divergences between Dr. Schott's work in the Handbook of the Marine Observatory and in the wall map—notably in the limitations of the Brazil Current and the Agulhas Current, where it appears that the Handbook is more in accord with the state of our knowledge than the wall map. Another criticism is based upon the omission of the cold ice-bearing current west of Spitzbergen. The position of the Guinea Current in winter does not agree with the arrangement of the Isotherms, and the same is true in connection with the currents of the Gulf of Panama. These are, however, but isolated points in a map where there is much that is of a high character that is well worth careful study.

To the strictures upon the wall map, Dr. Schott replies in *Petermanns Mitteilungen*, Vol. 45, No. VII. He states that he prepared a map of currents, and not of temperature curves, and that the discrepancy between the map and the handbook is due to the necessity of having text and map in accord. He cites numerous authorities for his position as against Professor Krümmel.

Dr. Krümmel also reviews the article of M. J. Thoulet in the *Bulletin* of the Paris Geographical Society, Vol. 18, 1897, pp. 5–33.

This paper relates particularly to the sedimentary deposits on the coasts of France.

Thoulet thinks rightly that the shallow waters of the coast are of interest not only to the geologist, but to the navigator, the fisherman, the cable engineer, and also that they may prove useful in a practical way, since phosphates may eventually be obtained from this source. He criticises the German Fisheries maps because they appear only in black and white; whereas he believes shades of color would be better.

Dr. Krümmel points out the difficulty of using such finely colored maps on board a vessel when all is wet and the touch of a single dirty finger will damage or destroy their usefulness.

Thoulet gives directions for the preservation of specimens by drying them upon a plate and then putting them in a bottle with a paper bearing the locality and date. A clear classification is given of these sediments, based upon their mineralogical character and the size of the grains. The latter point is determined by the use of gauze sieves until nothing but the amorphous components are left behind, *i. e.*, such as cannot be determined to be mineral in composition by the microscope, and will not deposit more than 10 per cent. after standing for 40 minutes. Their composition is to be determined chemically as to whether they are limestone or clay.

The transition from sandy to clay bottom it is proposed to classify under four heads:

1, *Sand*, where up to 10 per cent. of clay is present; 2, *muddy sand*, where 10–30 per cent. of clay is found; 3, *sandy mud*, containing 60 per cent. of clay; and 4, *mud*, where there is from 60–100 per cent. of clay.

A color scheme is proposed which is well considered, and the criticism that the transitions are too gradual to be traced is met by the well-founded assertion that there are definite boundaries in nature which can be located. Thoulet proposes to interest a wide circle of amateurs in this work, in the way of gathering material, the specimens to be sent to some central station for analysis and classification. This would be a fitting sequel to the work of Delesse upon the *Lithologie du fond des mers*, and could appropriately be carried out by France in commemoration of the labors of that eminent student.

The third of Professor Krümmel's reviews deals with the discussion of the results obtained by means of the "Flaschenposten" of the German Marine Observatory. (*Archiv der Deutschen Seewarte*, Vol. XX, No. 2.) The courses taken by 643 bottles are discussed; 452 from the North Atlantic, 102 from the South Atlantic, 43 from the Indian, and 46 from the Pacific Ocean. It appears from a large number of similar observations that it makes very little difference whether the bottles are weighted with sand or not. It does not appear from the discussion what percentage of the bottles put in the water was heard from, but, judging from the results obtained by the Prince of Monaco, it can hardly be over eight or nine per cent.

Many valuable results were obtained by this means, however—as, for example, the course of the subdivisions of the Gulf Stream in the Bay of Biscay; the proof that there is no longer such a thing as the Rennell Current, already shown by the labors of the Prince of Monaco; the concentration of the currents of the tropical Atlantic toward the Caribbean Sea, where they form the centre of energy for the Gulf Stream, etc.

New light is also thrown upon the course of the currents southeast of the Cape Verde Islands. A confirmation of the theory that the earth's rotation plays a large part in the direction of these currents is readily obtained from the study of the curves in the high southern latitudes upon the chart.

It is important to note—though the fact is not new—that these currents, even when weak, are found contrary to the direction of the wind.

SECONDARY TIDAL UNDULATIONS.—In the *Transactions of the Royal Society of Canada* (Second Series, Vol. V, Sec. III, page 24), Mr. W. B. Dawson, C.E., presents an account of observations obtained by recording tide gauges in Nova Scotia. The localities chosen are Halifax, St. Paul Island, N. S., Yarmouth, N. S., and St. John, N. B. The progress in the tide is in the order of the places named, and its range increases in the same order.

It appears from the facsimile reproductions of the records that these secondary undulations are almost continuously present, although their range varies; the range being in the cases mentioned from an inch or two to four feet. In the case of Halifax this range is 33% of the range of the tide, at St. Paul 10%, at Yarmouth 45%, and at St. John, N. B., 11%. The undulations are most conspicuous on the traces at the times of high and low water.

No theory is advanced for these wavelets upon the tidal wave. It is, however, pointed out that they occur chiefly at times of storm disturbances. In any theory explaining the undulations a careful distinction should be drawn between their originating cause and their progress, as the examples given seem to indicate that the range of the undulations does not become magnified in the same ratio as the tidal undulation under the influence of the general features of the coast.

This problem has been taken up by Mr. Dawson in a region peculiarly fitted for such work, since the tides range from the highest in the world to a very flat tidal curve, which is almost inappreciable except at the spring; and only these secondary undulations are left in addition to the traces of storm disturbances. Records have now been secured at eight different stations, covering periods of from two to four years. The data thus obtained would almost seem to be sufficient to warrant some conclusions, but the Tidal Survey has so far not been able to take up the subject.